REMARKS

The present application contains claims 1-7, 10-16, 31-38, 41, 44-46, and 48-56.

Applicant has amended claims 1, 10, 31, 51 and 52 to recite "at tip and ring of a cooper loop", and "storing in data registers on a per bin basis". Support for the amendment may be found, for example, in the abstract, at paragraphs [0013], [0014], [0029]-[0031] and [0051] and in claims 39-40, and 42-43. Accordingly, Applicant has cancelled claims 39-40, and 42-43 without prejudice or disclaimer.

Rejection under 35 U.S.C §103

The Office rejected claims 1-7, 10-16, 31-43, 47-50, 51, 53, and 55 under 35 U.S.C.§103 (a) as being unpatentable over Herzberg (US Patent 6,459,678), hereinafter referred to as Herzberg in view of Abbas et al., (U.S. Publication No. 2002/0080867), hereinafter referred to as Abbas.

Applicants respectfully traverse the rejection to the extent such rejection may be considered applicable to the amended claims.

The present claimed invention is directed to a method, an apparatus and a storage medium readable by a computer, for retrieving channel characteristics of a DSL channel. The method comprises the steps of determining at tip and ring of a cooper loop, and storing in data registers on a per bin basis channel a frequency response measurement and a noise measurement measured at a first end of the DSL channel at initialization; determining and storing on a per bin basis a signal-to-noise measurement measured at the first end of the DSL channel at initialization; and transmitting the channel frequency response measurement, the noise measurement and the signal-to-noise measurement from the first end to a second end of the DSL channel.

Herzberg does not teach or suggest, at least, following limitations of the present invention.

1. Determining channel frequency response and a noise at tip and ring of a copper loop

Herzberg teaches method and logic that measure the channel response for each of the DMT subchannels; and measure the noise variance for each of the DMT subchannels. However, Herzberg's measurement includes the transmitter filter, the receiver filter and the gain provided by the ADC which is part of the A/D converter. See numeral 38 in Figure 1 and numerals 46 and 48 in Figure 3 of Herzberg.

Due to the large range of different twisted pair loops over which high speed modems operate and the varying amount of interference, the received signal at the analog-to-digital converter input can present a dynamic range of over 70 dB.

In practice, for diagnostics purpose, the desired quiet line noise is the environment noise at termination of the copper loop, i.e. at tip and ring of a copper loop as claimed. Similarly, the desired channel characteristics are the channel characteristics at termination of the copper loop.

This is not a trivial task, as evidenced by section 8.12.3.1 in ITU-T G.992.3:

"The objective is to provide means by which the channel characteristics can be accurately identified. Therefore, it is necessary for the receive PMD function to report an estimate of the channel characteristics. This task may prove to be a difficult one given the fact that the receive PMD function only observes the cascade of all three elements of the channel. The passband part of the reported H(f), which is most essential to debug possible issues with the physical loop, is not expected to significantly depend upon the receiver filter characteristics (not including receiver AGC). The receive PMD function shall therefore undo the gain (AGC) it has applied to the received signal and do a best effort attempt to remove the impact of the near-end receiver filter characteristics. The result is then a best estimate of how the receiver views the passband channel characteristics plus the transmitter filter characteristics. Because the in-band portion of the spectrum is also expected not to

significantly depend upon the transmitter filter characteristics, this result is considered a sufficient estimate of the channel characteristics for desired loop conditioning applications." (emphasis added)

Similarly, when referring to estimation of quiet line noise, the ITU-T G.992.3 standard states: "[t]he objective is to provide means by which the quiet line PSD can be accurately identified. Therefore, it would be necessary for the receive PMD function to report an estimate of the quiet line PSD. <u>This task may prove to be a difficult one</u> given the fact that the receive PMD function <u>observes the noise through the receiver filter</u>. The passband part of the reported QLN-ps, which is most essential to debug possible issues with the physical loop, is not expected to significantly depend upon the receiver filter characteristics (not including receiver AGC). <u>The receive PMD function shall therefore undo the gain (AGC) it has applied to the received signal and do a best effort attempt to remove the impact of the near-end receiver filter characteristics</u>. The result is then a best estimate of how the receiver views the passband quiet line PSD. This result is considered a sufficient estimate of the quiet line PSD for desired loop conditioning applications" (emphasis added)

By determining channel frequency response and noise at tip and ring of a copper loop, the effect of the filter (on channel characters and quiet line noise) at the receiver end and the effect of the gain applied (to the received signal and noise) by the receiver are removed. When the signal arrived at the modem (in CO or CPE), before it passes through the filter, it does not have the filter effect and the receiver has not applied the gain to the signal. Using the known transmitted signal at the transmitter end and the received signal at tip and ring of a copper loop, channel characteristics can be derived. Applicants were the first to recognize the advantage of this approach.

<u>2. storing in data registers</u>

The Examiner stated that Herzberg teaches storing on a per bin basis of channel characteristics or noise.

Applicants respectfully request reconsideration.

Herzberg only teaches storage medium 74 as memory devices containing the program code and data used to implement the functionality of receiving modem 70. In other words, storage medium 74 is used to contain program code modules for optimizing DMT subchannel bit allocation. *See* column 5, lines 37-48 of Herzberg.

Herzberg does not teach or suggest the storing on a per bin basis of channel characteristics or noise as claimed by the present application.

To provide greater clarity, Applicants have amended the base claims to include "storing in data registers on a per bin basis".

Abbas does not overcome the basic deficiencies of Herzberg as discussed in the foregoing.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In *re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In *re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). The Examiner has not met his burden as at least the foregoing elements of the independent claims are not taught or suggest by the prior art.

Claims 2-7, 11-16, 32-38, 41, 44-46, 48-50, and 53-56 are dependent claims which further distinguish the invention, and which are allowable for the same reasons as their respective independent base claims.

Withdrawal of the rejections of claims 1-7, 10-16, 31-43, 47-50, 51, 53, and 55 is therefore requested.

Applicants respectfully request reconsideration of this application, based on the foregoing amendments and remarks.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 625-3507. All correspondence should continue to be directed to our address given below.

Respectfully Submitted,

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